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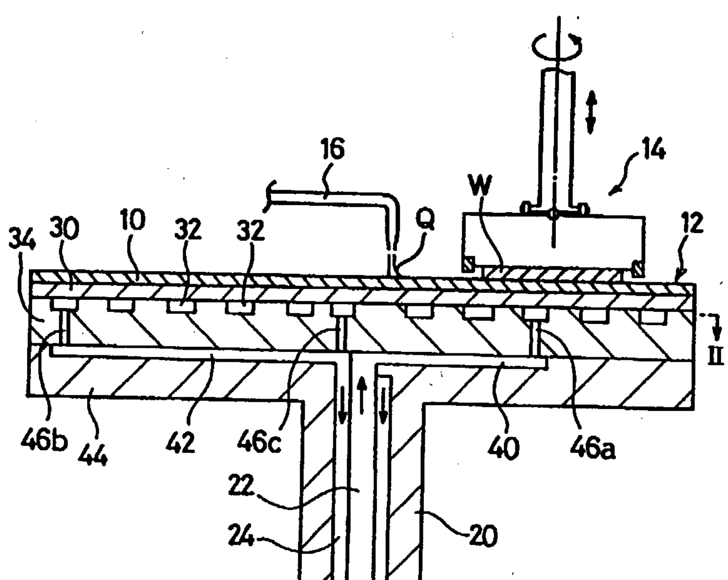

(57) Abstract

A polishing apparatus can strictly control the degree of material removal by providing a close control over the operating temperature in the polishing table (12). The polishing apparatus comprises a polishing table (12) and workpiece holder (14) for pressing a workpiece (W) towards the polishing table (12). The polishing table (12) has a polishing section (30) or a polishing tool attachment section at a surface thereof and a thermal medium passage (32) formed along the surface. The thermal medium passage (32) comprises a plurality of temperature adjustement passages provided respectively in a plurality of temperature adjustment regions which are formed by radially dividing a surface area of the polishing table (12).

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DESCRIPTION

POLISHING APPARATUS AND POLISHING TABLE THEREFOR

Technical Field

The present invention relates to polishing apparatuses, and relates in particular to a polishing table for providing a flat and mirror polished surface on a workpiece such as semiconductor wafer.

Background Art

Advances in integrated circuit devices in recent years have been made possible by ultra fine wiring patterns and narrow interline spacing. The trend towards high density integration leads to a requirement of extreme flatness of substrate surface to satisfy the shallow depth of focus of stepper in photolithographic reproduction of micro-circuit patterns. A flat surface can be obtained on semiconductor wafer by chemical-mechanical polishing using a polishing table and a wafer carrier to press the wafer surface on the polishing cloth mounted on the polishing table while supplying a polishing solution containing abrasive particles at the polishing interface.

An example of the conventional polishing apparatus is shown in Figure 9. A polishing table 12 capped with a polishing cloth 10 is used in conjunction with a top ring (wafer carrier) 14 for holding and pressing the wafer W onto the rotating top ring 14 with an air cylinder. Polishing solution Q is supplied from a solution nozzle 16, and the solution is retained in the interface between the cloth 10 and the bottom surface of the wafer W to be polished.

In such a polishing apparatus, heat is generated by friction between the wafer W and the cloth 10, and a part of the heat is carried by the polishing solution while remainder is transferred to the top ring 14 and the polishing table 12

and is removed by cooling mechanism provided in these devices. A structural configuration of the polishing table 12 is shown in Figure 10, which shows that the circular interior of the polishing table 12, made of stainless steel, has a spiral fluid passage 18 for flowing a thermal medium supplied through concentric shaft passages 22, 24 formed in the interior of a shaft 20. A rotary coupling is used to transport the thermal fluid from an external source through the passages 22, 24.

In chemical-mechanical polishing in general, and especially when using an acidic or alkaline solution, the rate of material removal is dependent sensitively on the temperature at the polishing interface. Therefore, in order to improve the uniformity of material removal across the surface of the wafer W, it is desired to control the polishing temperature distribution uniformly or in accordance with a predetermined temperature distribution pattern by controlling the flow rate of the fluid medium flowing through the spiral fluid passage 18 in the polishing table 12.

However, because the polishing table 12 is made of stainless steel in the conventional polishing apparatus, thermal conductivity is low, and it has been difficult to control the temperature of the polishing table 12 to provide the desired degree of thermal response characteristics. Also, the simplistic unidirectional flow pattern of the thermal fluid passage 18 results in a time lag for transferring heat between the center region and the outer region of the polishing table 12, and presents a problem that the polishing table 12 is unable to control individual temperatures of different regions of the turntable that are subjected to different polishing conditions.

Disclosure of Invention

It is an object of the present invention to provide a polishing apparatus to enable to strictly control the degree of material removal by providing a close control over the

operating temperature in the polishing table.

The object has been achieved in polishing apparatus comprising a polishing table and a workpiece holder for pressing a workpiece towards the polishing table, the polishing table having a polishing section or a polishing tool attachment section at a surface thereof and a thermal medium passage formed along the surface, wherein the thermal medium passage comprises a plurality of temperature adjustment passages provided respectively in a plurality of temperature adjustment regions which are formed by radially dividing a surface area of the polishing table.

Accordingly, the lengths of individual passages are shortened so that the thermal medium passes through the passages quickly without experiencing much temperature variation, thereby stabilizing the polishing interface temperature and enabling to reflect temperature control changes quickly to the actual table temperatures to improve startup time and responsiveness of the polishing system. Also, because the flow of the thermal medium can be controlled for individual regions of the polishing table, a finely-tuned temperature control can be performed to suit local changes encountered in the various regions of the polishing table.

The thermal medium passages may include two temperature adjustment passages extending from a mid-radially disposed fluid entry port, such that one passage extends to a center of the polishing table while other passage extends to a periphery of the polishing table.

Accordingly, the passage is divided into two sections of shorter lengths, the time required for the thermal medium to pass through the passages is lessened, thereby enabling to reflect temperature control changes quickly to the actual table temperatures to improve startup time and responsiveness of the polishing system. Also, because the thermal medium flows into the region of the table where polishing is performed, temperature

control of the workpiece can be achieved quickly.

The apparatus may be provided with flow adjustment valves for individually controlling fluid flow rates in the temperature adjustment passages.

The apparatus may be provided with temperature adjustment means for individually controlling temperatures of thermal media to be supplied to the temperature adjustment passages.

The apparatus may also be provided with sensor means for measuring temperatures in various locations of the surface region and flow control means for controlling individual flow rates of thermal media flowing in the temperature adjustment passages.

In another aspect of the invention, a polishing apparatus comprises a polishing table and a workpiece holder for pressing a workpiece towards the polishing table, the polishing table having a polishing section or a polishing tool attachment section at a surface thereof and a thermal medium passage formed along the surface, wherein at least surface region of the polishing table is made of a material of high thermal conductivity. Preferred materials include SiC which has a thermal conductivity higher than 0.06 cal/cm/s/°C.

In another aspect of the invention, a polishing table has a polishing section or a polishing tool attachment section at a surface thereof and a thermal medium passage formed along the surface, wherein the thermal medium passage comprises a plurality of temperature adjustment passages provided respectively in a plurality of temperature adjustment regions which are formed by radially dividing a surface area of the polishing table.

In the present polishing apparatus, because individual flow rates in various regions of the polishing table can be controlled, finely-tuned temperature control can be carried out to suit variations and changes in local polishing conditions. Temperature control is further enhanced by selecting a material

of high thermal conductivity for at least in those parts associated with the surface region, heat transfer rate from the thermal passages to the surface region is facilitated so that thermal lag time is reduced and responsive temperature control can be achieved. Therefore, the present polishing system provides superior polishing in a variety of situations, thereby presenting an important technology for manufacturing of highly integrated semiconductor devices.

Brief Description of Drawings

Figure 1 is a schematic cross sectional view of the polishing table in a first embodiment;

Figure 2 is a perspective view through a section II in Figure 1;

Figure 3 is a schematic cross sectional view of the polishing table in a second embodiment;

Figure 4 is a perspective view through a section IV in Figure 3;

Figure 5 is an enlarged cross sectional view of the essential section in Figure 3;

Figure 6 is a flowchart for the steps in the control process in a third embodiment;

Figure 7A is a schematic cross sectional view of the polishing table in the third embodiment;

Figure 7B is a schematic plan view of the temperature adjustment fluid passage shown in Figure 7A;

Figure 8 is a flowchart for the steps in the control process in the third embodiment;

Figure 9 is a cross sectional view of a conventional polishing table; and

Figure 10 is a perspective view through a section X in Figure 9.

Best Mode for Carrying Out the Invention

In the following, the first embodiment according to the present invention will be presented with reference to Figures 1 and 2. Polishing table 12 is comprised by: an upper plate 30 having a polishing cloth 10 mounted on top; a second plate 34 having a spiral-shaped temperature adjustment fluid passage 32 formed on a top surface region; and a lower plate 44 having incoming and outgoing thermal medium supply passages 40, 42 extending radially and communicating respectively with concentric fluid passages 22, 24. The second plate 34 is provided with three connecting passages 46a, 46b and 46c for communicating the temperature adjustment fluid passage 32 with the incoming and outgoing supply passages 40, 42 of the lower plate 44.

An incoming connecting passage 46a meets the spiral-shaped temperature adjustment fluid passage 32 at about the radial mid-point between the center and periphery of the polishing table 12. That is, the opening of the incoming connecting passage 46a is located below the polishing table 12 to correspond with the location of the workpiece W, as illustrated in Figure 1. Outgoing connecting passage 46b is connected to the outside end of the passage 32, and outgoing connecting passage 46c is connected to the inside end of the temperature adjustment fluid passage 32 of the polishing table 12.

Therefore, an internal thermal medium passage is formed in the polishing table 12 so that the thermal medium flows out from the outlet of the inner concentric fluid passage 22 radially along the incoming supply passage 40 in the lower plate 44, and then flows through the incoming connecting passage 46a of the second plate 34 to flow into the temperature adjustment fluid passage 32. Then, the thermal medium flows through the temperature adjustment fluid passage 32 to branch into inward and outward directions. Inward and outward flows reach the inside and outside ends of the temperature adjustment passage

32 and go forward through outgoing connecting passages 46c, 46b, respectively, into the outgoing supply passage 42 to return through the outer concentric passage 24.

In the polishing table 12 of such a construction, temperature adjustment passage 32 is divided into two sections, and the individual passage is made short so that the circulation time for the thermal medium is shortened. Therefore, time necessary for starting up the polishing operation can be shortened, and a quick response in temperature change for controlling operation can be achieved. Also, because the opening of the passage is located opposite to the workpiece W in this embodiment, an advantage is that rapid temperature control at the most critical region of the workpiece can be achieved efficiently.

In addition to the features presented above, surface temperature of the upper plate 30 can be made uniform by maintaining a constant flow rate of thermal medium per unit area of the upper plate. To achieve this objective, the cross sectional area of the fluid passage may be varied on the outside passage (draining through 46b) and on the inside passage (draining through 46c) of the temperature adjustment passage 32 so as to achieve a constant flow rate in each case. It is also possible to adjust the flow rates by providing a suitable flow adjusting valve in the outgoing connecting passages 46b and 46c so as to produce a constant flow rate per unit area of the upper fixed plate 30.

It is also possible to provide a thermal insulation cover for the bottom surface of the lower plate 44 for preventing heat radiation therefrom thereby to facilitate temperature control of the upper plate 30, so that thermal response time lag is decreased to achieve even more improved temperature control in the upper plate 30.

It should be noted that although the thermal fluid is supplied from one entry port and drained through two exit ports

in the foregoing embodiment, it is also permissible to arrange a plurality of entry ports and drainage through a common outlet thereby to provide a plurality of temperature adjustment passages so as to obtain similar thermal control effects.

The second embodiment will be presented in the following with reference to Figures 3 to 6. The polishing table 12, in this embodiment, is comprised by: an upper plate 30 having a polishing cloth 10 mounted on top; a second plate 34 having a plurality (five shown in Figure 3) of circular groove-shaped temperature adjustment fluid passages 32a, 32b, 32c, 32d, 32e formed on the top surface; a third plate 38 having a space 36 formed at certain locations; and a lower plate 44 having incoming and outgoing thermal medium supply passages 40, 42 extending radially and communicating with the concentric fluid passages 22, 24. As shown in Figure 5, the space 36 within the third plate 38 is provided for the purpose of accommodating incoming and outgoing connecting pipes 46a, 46b for communicating the thermal fluid passages of second and lower plates 34, 44, and flow adjusting valves 48a, 48b, 48c, 48d, 48e provided on the incoming connecting pipes 46a and associated drive mechanisms, as well as a control unit (CPU) 50 and associated devices, which will be explained later.

In this polishing apparatus, thermal fluid passage is arranged so that thermal fluid flows as follows. Fluid enters into the lower plate 44 from the concentric center passage 22 and flows radially along the incoming supply passage 40 until the respective intersecting points with the temperature adjustment passages 32a, 32b, 32c, 32d, 32e, and then flows further upwards through respective incoming connecting pipes 46a, and then enters and flows half-way along each of the passages 32a, 32b, 32c, 32d, 32e. The fluid returns radially through the outgoing passage 42 and flows through the outgoing connecting pipes 46b to return through the outer concentric passage 24.

At certain locations on the surface of the upper plate

30, thermocouples 52a, 52b, 52c, 52d, 52e are provided to correspond to the locations of each temperature adjustment passages 32a, 32b, 32c, 32d, 32e. Output cables from the thermocouples are connected to a control unit (CPU) 50 disposed in the center space in the third plate 38, in this case. This control unit 50 is operated by a certain software, and generates a valve-control signal for each of the flow adjustment valves 48a, 48b, 48c, 48d, 48e in accordance with the output voltages from thermocouples 52a, 52b, 52c, 52d, 52e. In this example, CPU is operated independently by an internal power, but it may be controlled by an external controller by providing an appropriate wiring circuitry. Flow adjustment valves 48a, 48b, 48c, 48d, 48e may be operated by electric motor or pressure air source.

In this embodiment, the upper two plates (upper plate 30 and second plate 34) of the plates 30, 34, 38 and 44 to comprise the polishing table 12 are made of a highly thermally conductive material such as SiC so as to improve the responsiveness of the polishing surface for thermal controlling. SiC has a thermal conductivity of 0.07 cal/cm/s/°C which is about twice the value for stainless steels. It is not necessary for the third plate 38 and the lower plate 44 to have particularly high thermal conductivity, and, in fact, lower thermal conductivity of stainless steels is desirable to prevent temperature changes in the thermal medium flowing therethrough.

The operation of the polishing apparatus of the construction presented above will be explained with reference to the flowchart shown in Figure 6. Thermal medium is prepared by an external supply device so that the thermal medium (cooling water in this case) is at a desired temperature. Control unit 50 is pre-programmed with a target temperature T_n (n=a, b, ...e) for each of the temperature adjustment passages 32a, 32b, 32c, 32d, 32e (step 1). Top ring 14 and the polishing table 12 are rotated respectively while supplying a polishing solution Q on

the surface of the polishing cloth 10 through the solution nozzle 16, and the workpiece W held by the top ring 14 is pressed against the cloth 10 to perform polishing (step 2). Surface temperature of the workpiece W is altered in accordance with a thermal balance between heat generated by friction and heat removed by the polishing solution and others.

During polishing, temperature measurements are taken at certain intervals (step 3), and thermocouples 52a, 52b, 52c, 52d, 52e output respective temperature measurements t_n to the control unit 50. Control unit 50 compares measured temperatures t_n with target temperatures T_n (step 4), and if $T_n=t_n$ (within an allowable deviation range), polishing is continued at the same settings and steps subsequent to step 3 are repeated. If $T_n>t_n$, flow rate is decreased by reducing the opening of the corresponding flow adjustment valve 48n (step 5), and if $T_n>t_n$, the opening of the flow adjustment valve 48n is increased (step 6), and the steps subsequent to step 3 are repeated to continue polishing.

Accordingly, in the polishing apparatus in this embodiment, the polishing table 12 is divided into a plurality of ring-shaped regions to form individual temperature adjustment passages 32a, 32b, 32c, 32d or 32e so as to enable adjusting the flow rates independently in respective passages. This configuration of the thermal regions enable to respond suitably to changes in local polishing conditions of the polishing surface, so that more uniform distribution of temperature can be obtained over the workpiece W by finely adjusting temperature in each region. Also, in this embodiment, because the upper plate 30 is made of SiC, which has a high thermally conductivity, result produced by flow rate changes can be reflected quickly in the surface temperature, thereby providing a thermally responsive apparatus.

Figures 7A, 7B and 8 show other embodiments of the present invention. In this case, two thermal medium supply passages 40a,

40b are provided to direct two thermal media from external sources to the polishing table 12. Inlet ports of the individual temperature adjustment passages 32a, 32b, .. 32e are communicated to thermal medium supply passages 40a, 40b through individual flow adjustment valves 48a, 48b and connecting passages 51. Outlet ports of the individual temperature adjustment passages 32a, 32b, .. 32e are communicated to return passage 54 through individual connecting passages 53. Temperatures itself of thermal medium flowing into the passages 32a, 32b, .. 32e are changed, in this case, by changing the mixing ratio of the two thermal media. Individual channel of the temperature adjustment passages is made as shown in Figure 7B so that each passage is provided with an inlet port and an outlet port which are located at the ends of each of concentric severed rings and connected to respective incoming and outgoing connecting passages 51, 53. Two thermal medium passages 40a, 40b are separated by a thermally insulative structure.

Operational steps will be explained with reference to a flowchart shown in Figure 8. The difference in control methodology from that in Figure 6 is that the object of control in steps 5 and 6 in Figure 6 is the flow rate of thermal medium while the object of control in Figure 8 is the mixing ratio of first thermal medium and a second thermal medium. In other words, when the measured temperature is less than the target temperature, the proportion of warm water is increased (step 5), and conversely, when the measured temperature is higher than the target temperature, the proportion of cold water is increased (step 6). It is permissible to adjust the flow rates of both media concurrently.

In this embodiment, because two thermal media of different temperatures are used, the rate of temperature change is increased compared with the previous embodiments, and therefore, highly responsive temperature control can be achieved. Also, the range of temperature control can be widened from a low

temperature given by the cold water to a high temperature given by the warm water. In the examples given above, temperature was controlled to achieve a uniform distribution, but it is permissible to polish various regions of the workpiece at intentionally targeted individual temperatures.

In the above-described embodiments, the polishing table comprises a polishing cloth mounted on a surface plate of the turntable. However, it is also permissible to use a turntable having a grindstone mounted on the surface plate as a polishing tool. The grindstone is less susceptible against deformation thereby capable of providing a high flatness of the polished surface. In this case, the grindstone can be made of a high thermal conductivity material thereby to provide a high responsiveness for temperature control of the polishing table.

Industrial Applicability

The present invention is useful as a polishing apparatus for providing a mirror polished surface on a workpiece in a manufacturing process of semiconductor wafer or liquid crystal display.

CLAIMS

1. A polishing apparatus comprising a polishing table and a workpiece holder for holding and pressing a workpiece against said polishing table,

said polishing table having a polishing section or a polishing tool attachment section at a surface thereof and a thermal medium passage formed along said surface,

wherein said thermal medium passage comprises a plurality of temperature adjustment passages provided respectively in a plurality of temperature adjustment regions which are formed by radially dividing a surface area of said polishing table.

2. A polishing apparatus according to claim 1, wherein said thermal medium passage includes two of said temperature adjustment passages extending from a fluid entry port disposed between a center and periphery of said polishing table, such that one passage extends to a center of said polishing table while other passage extends to a periphery of said polishing table.

3. A polishing apparatus according to claim 2, wherein said fluid entry port is located at a radial position corresponding to that of said workpiece holder while polishing.

4. A polishing apparatus according to claim 1, wherein said apparatus is provided with flow adjustment valves for individually controlling fluid flow rates in said temperature adjustment passages.

5. A polishing apparatus according to claim 1, wherein said apparatus is provided with temperature adjustment means for individually controlling temperatures of thermal media to be supplied to said temperature adjustment passages.

6. A polishing apparatus according to claim 1, wherein said apparatus is provided with sensor means for measuring temperatures in various locations of said surface region and flow control means for controlling individual flow rates of thermal media flowing in said temperature adjustment passages in accordance with output of said sensor means.

7. A polishing apparatus according to claim 1, wherein at least surface region of said polishing table is made of high thermal conductivity material.

8. A polishing apparatus according to claim 7, wherein said high thermal conductivity material has a thermal conductivity higher than 0.06 cal/cm/s/°C.

9. A polishing apparatus according to claim 7, wherein said high thermal conductivity material comprises SiC.

10. A polishing apparatus comprising a polishing table and a workpiece holder for pressing a workpiece towards said polishing table,

said polishing table having a polishing section or a polishing tool attachment section at a surface thereof and a thermal medium passage formed along said surface,

wherein at least surface region of said polishing table is made of a material of high thermal conductivity.

11. A polishing apparatus according to claim 10, wherein said high thermal conductivity material has a thermal conductivity higher than 0.06 cal/cm/s/°C.

12. A polishing apparatus according to claim 10, wherein said high thermal conductivity material comprises SiC.

13. A polishing table having a polishing section or a polishing tool attachment section at a surface thereof and a thermal medium passage formed along said surface,

wherein said thermal medium passage comprises a plurality of temperature adjustment passages provided respectively in a plurality of temperature adjustment regions which are formed by radially dividing a surface area of said polishing table.

14. A polishing table according to claim 13, wherein said thermal medium passage includes two of said temperature adjustment passages extending from a fluid entry port disposed between a center and periphery of said polishing table, such that one passage extends to a center of said polishing table while other passage extends to a periphery of said polishing table.

15. A polishing apparatus according to claim 14, wherein said fluid entry port is located at a radial position corresponding to that of said workpiece holder while polishing.

16. A polishing table according to claim 13, wherein said apparatus is provided with flow adjustment valves for individually controlling fluid flow rates in said temperature adjustment passages.

17. A polishing table according to claim 13, wherein said apparatus is provided with temperature adjustment means for individually controlling temperatures of thermal media to be supplied to said temperature adjustment passages.

18. A polishing table according to claim 13, wherein said apparatus is provided with sensor means for measuring temperatures in various locations of said surface region and

flow control means for controlling individual flow rates of thermal media flowing in said temperature adjustment passages in accordance with output of said sensor means.

19. A polishing table according to claim 13, wherein at least surface region of said polishing table is made of high thermal conductivity material.

20. A polishing table according to claim 19, wherein said high thermal conductivity material has a thermal conductivity higher than 0.06 cal/cm/s/°C.

21. A polishing table according to claim 19, wherein said high thermal conductivity material comprises SiC.

22. A polishing apparatus comprising a polishing table and a workpiece holder for holding and pressing a workpiece against said polishing table,

said polishing table having a polishing section or a polishing tool attachment section at a surface thereof and a thermal medium passage formed along said surface, said thermal medium passage comprising a fluid entry port disposed midway between a center and periphery of said polishing table.

23. A polishing apparatus comprising a polishing table and a workpiece holder for holding and pressing a workpiece against said polishing table,

said polishing table having a polishing section or a polishing tool attachment section at a surface thereof and a thermal medium passage formed along said surface, said thermal medium passage comprising at least three fluid ports for entry and exit of said thermal medium.

F I G. 1

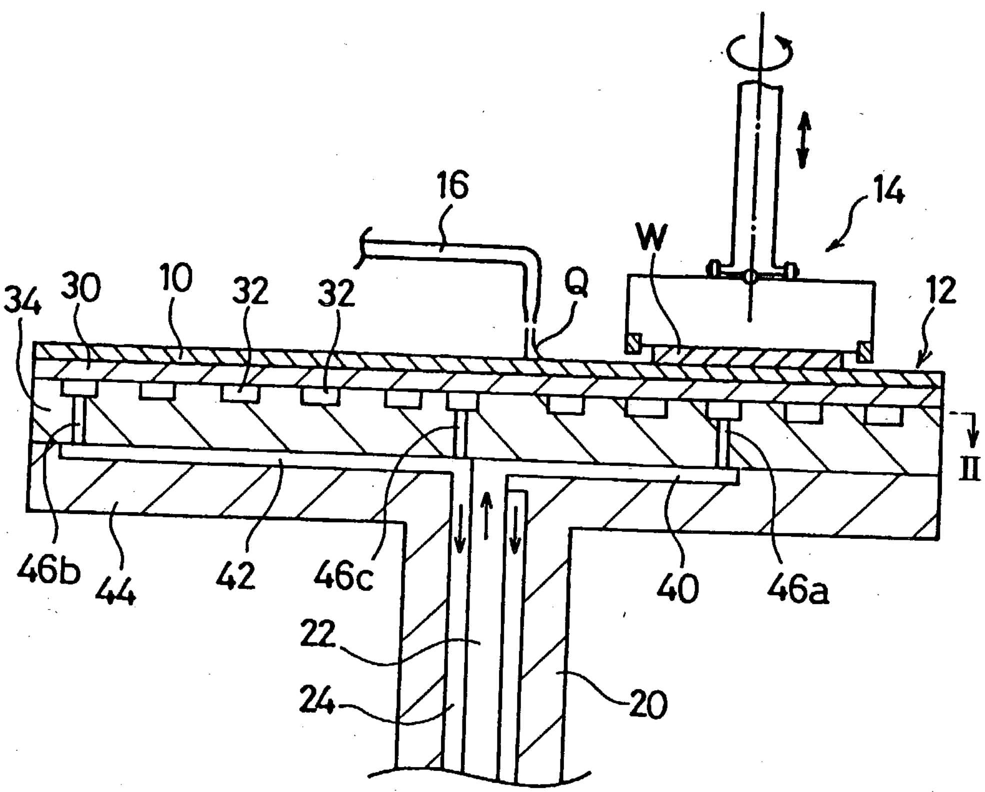
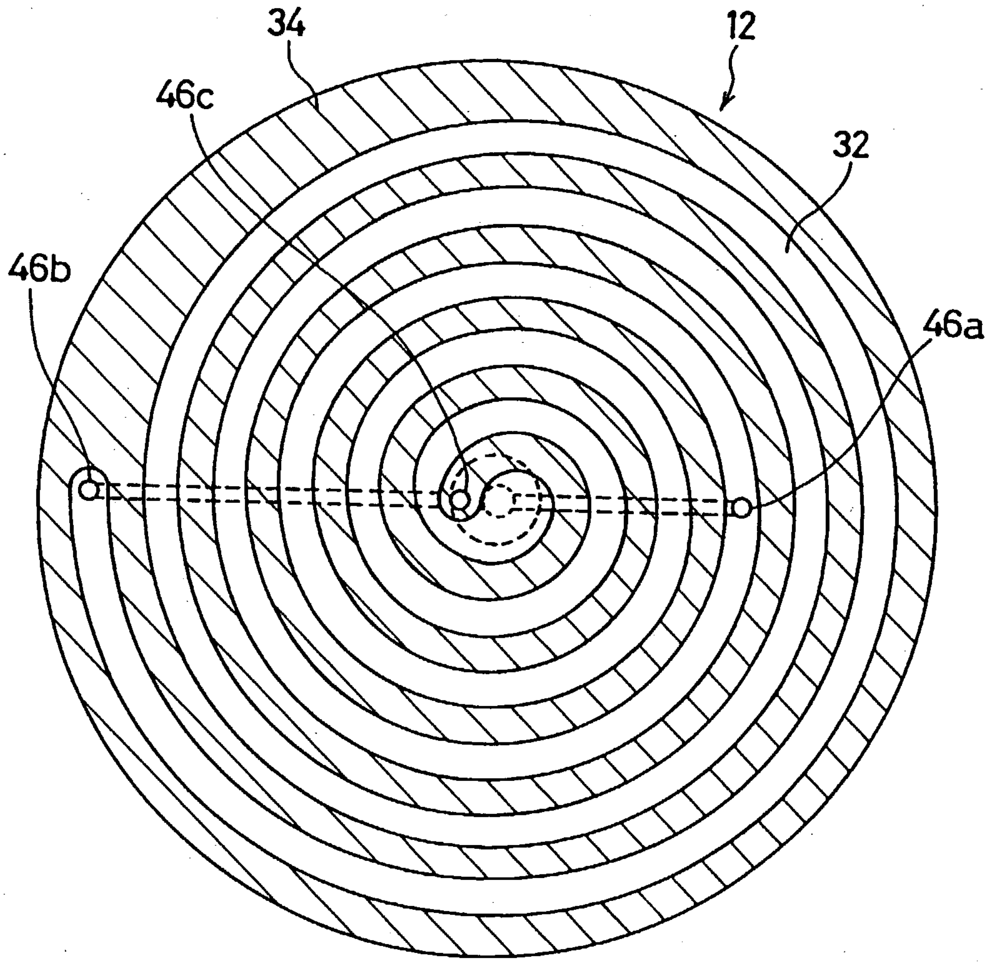


FIG. 2



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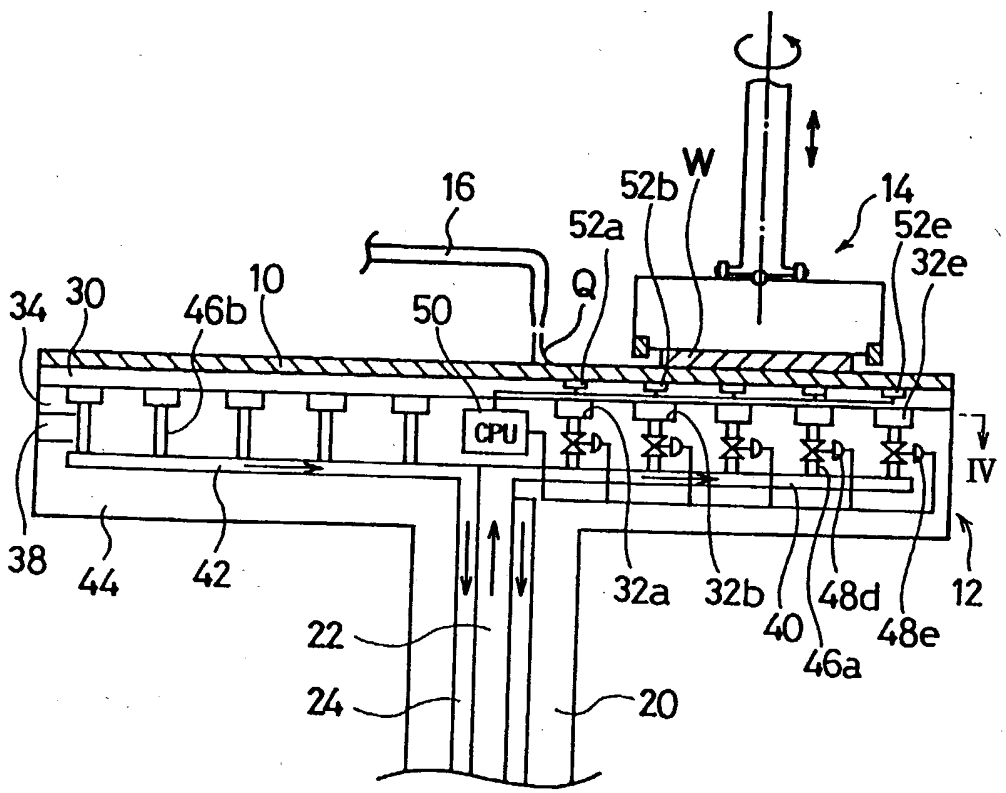
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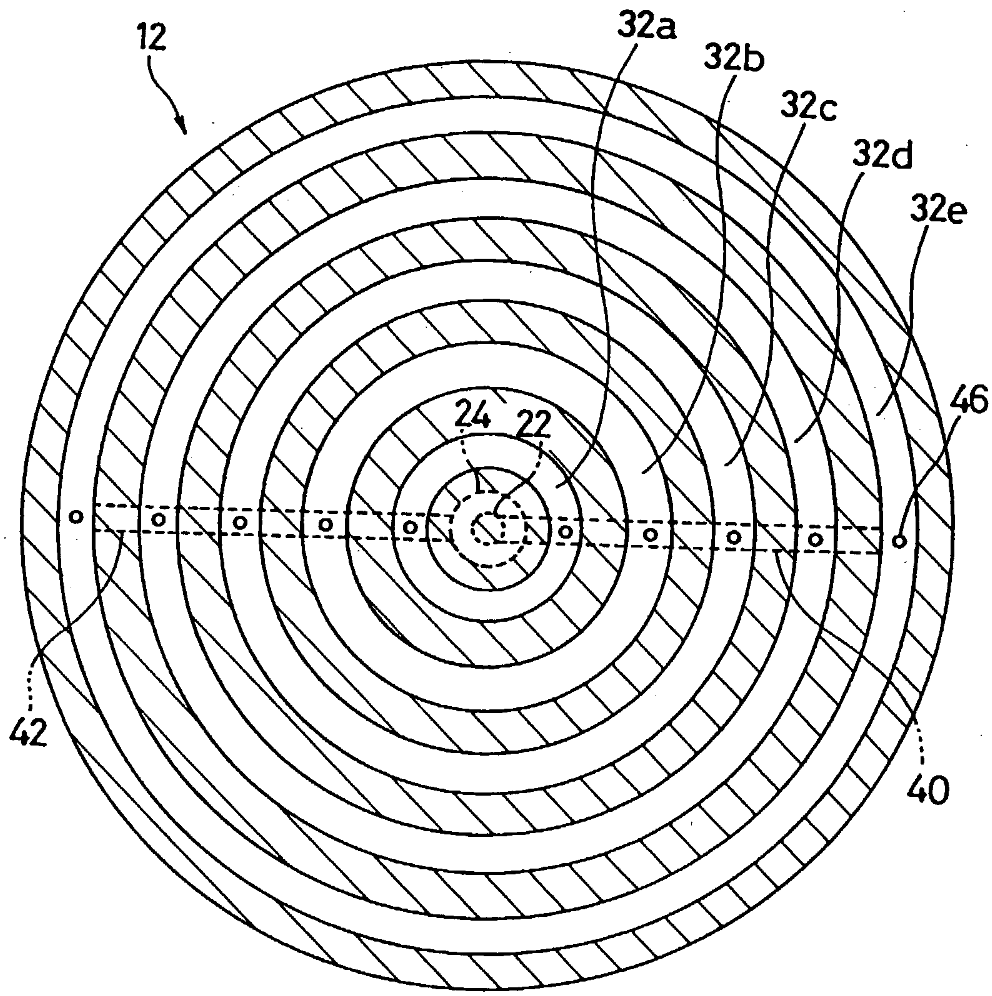

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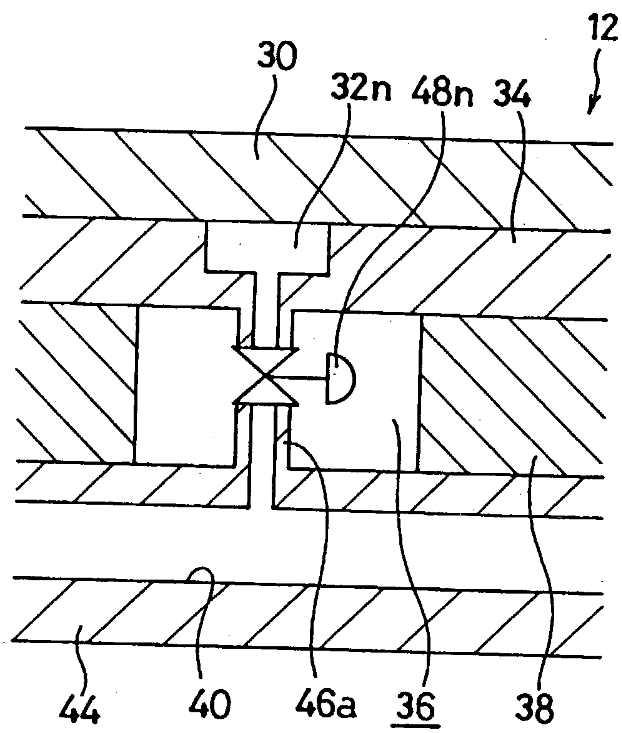

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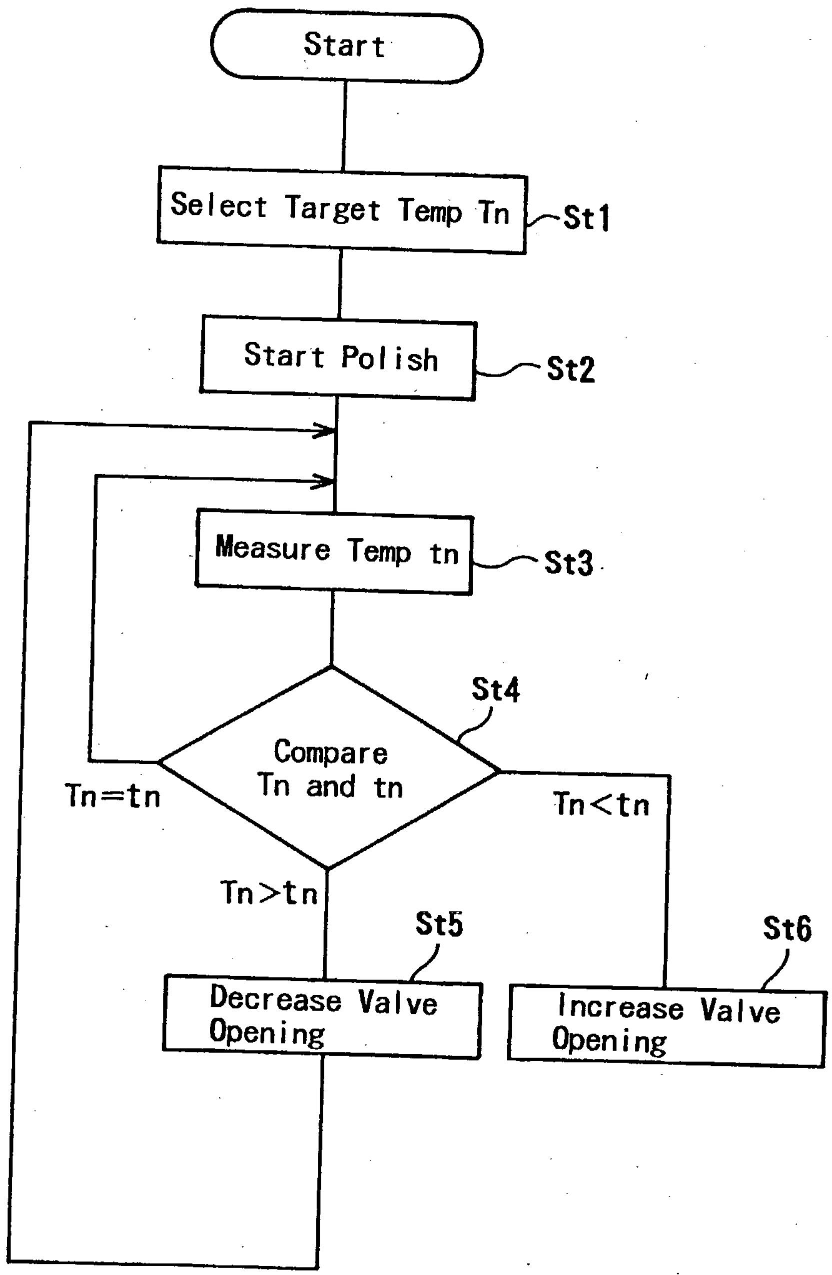
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St6
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Increase Valve
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FIG. 7A

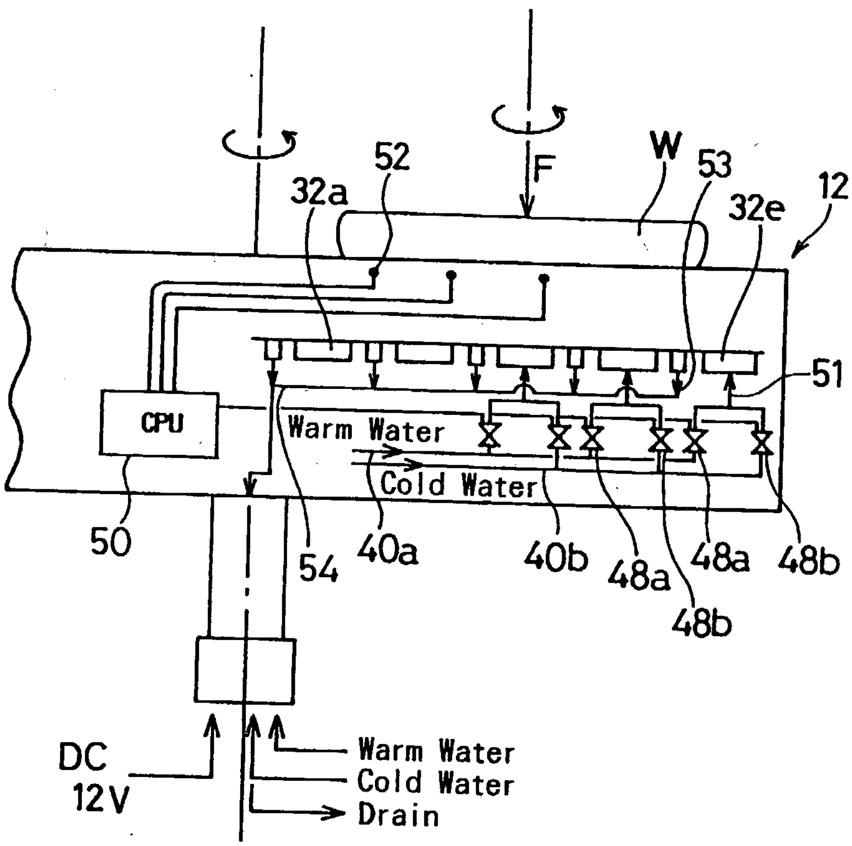
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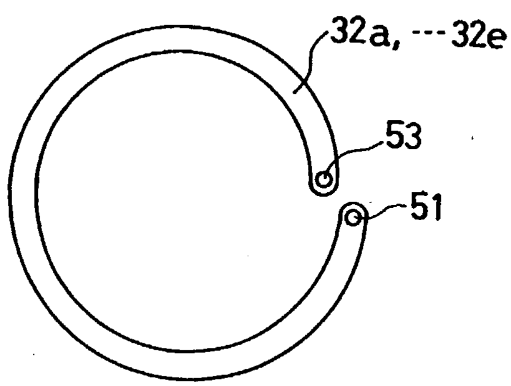
FIG. 7B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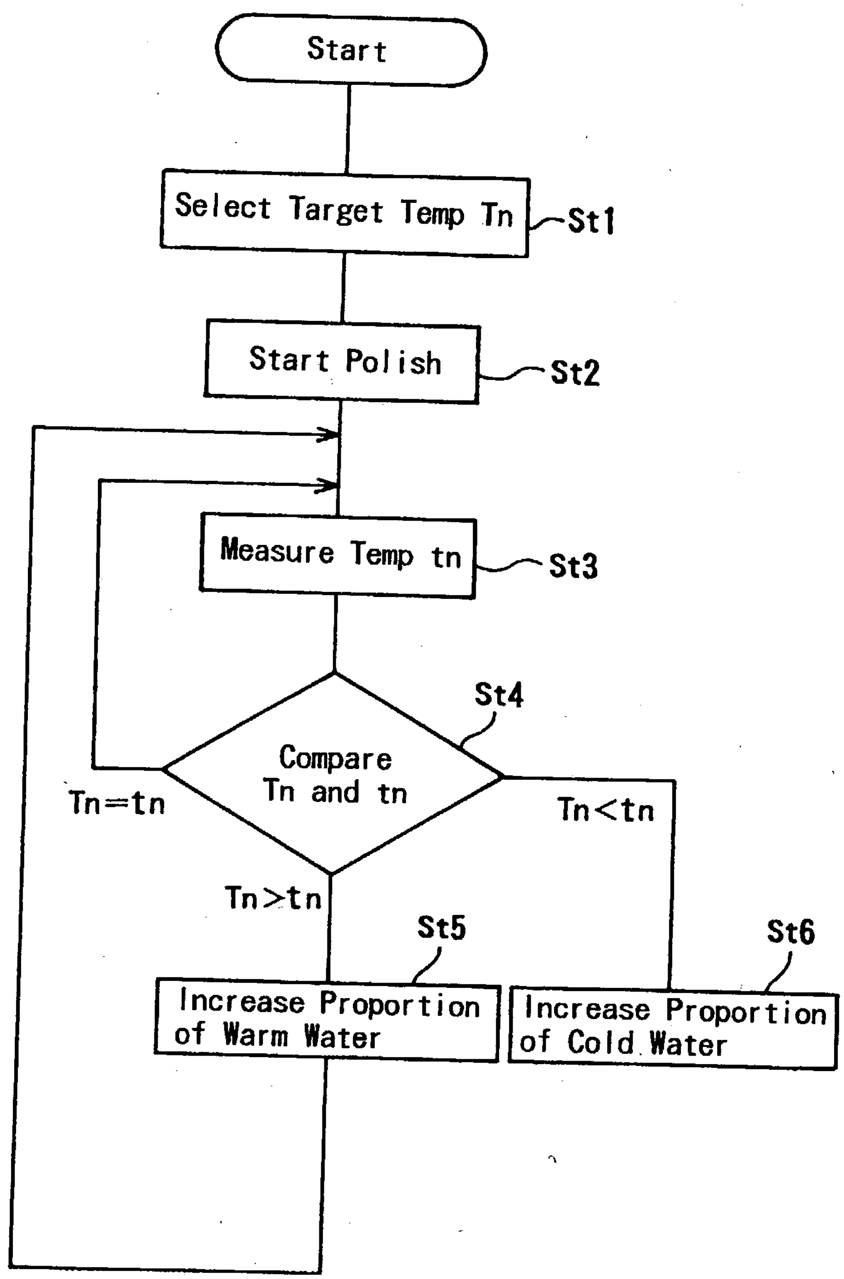
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St2
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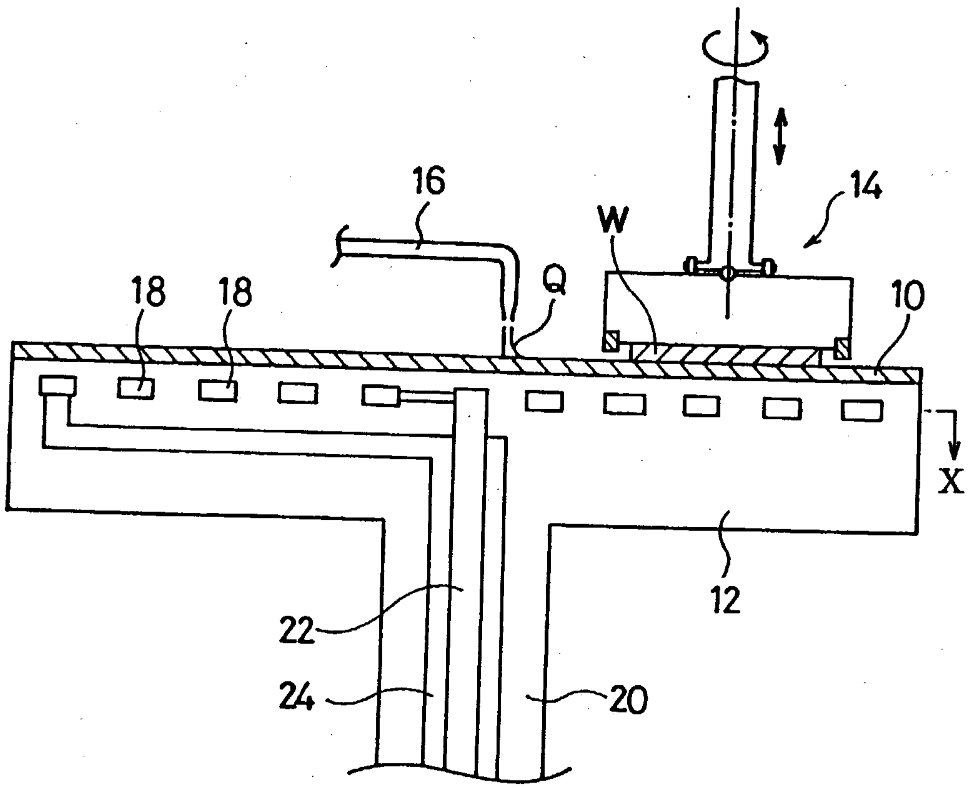
Increase Proportion of Cold Water

FIG. 9



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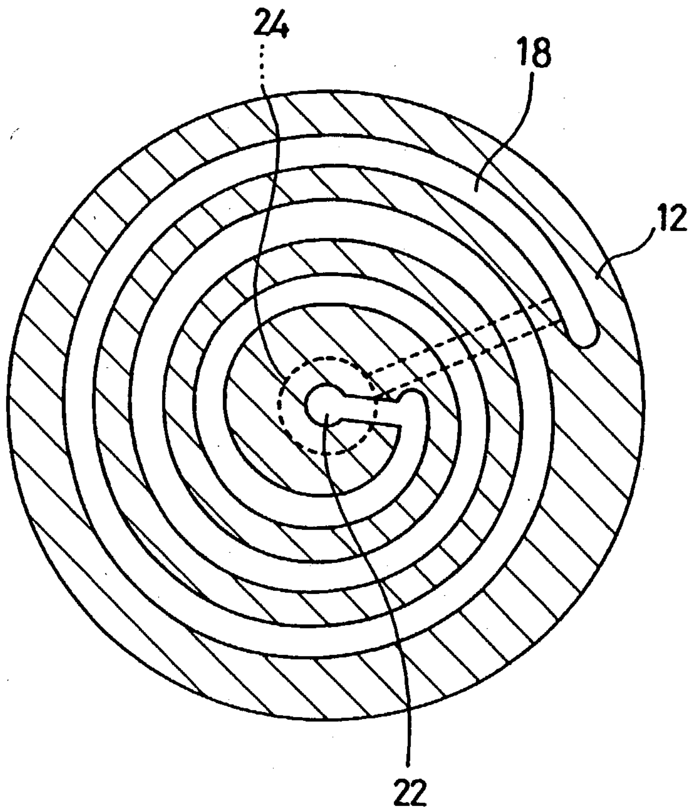

INTERNATIONAL SEARCH REPORT

International Application No
PCT/JP 99/00410

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B24B37/04 B24B49/14 //H01L21/304

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 B24B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 471 579 A (BOVENSIEPEN HANS-JOACHIM) 18 September 1984 see column 1, line 57 - column 2, line 47 ---	1,2,4-6, 10,13, 16-18
A	PATENT ABSTRACTS OF JAPAN vol. 011, no. 123 (M-581), 17 April 1987 & JP 61 265262 A (HITACHI LTD), 25 November 1986 see abstract ---	1,5,6, 10,13, 22,23
A	US 5 658 183 A (DOAN TRUNG TRI ET AL) 19 August 1997 -----	

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
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"O" document referring to an oral disclosure, use, exhibition or other means
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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28 May 1999	07/06/1999

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Eschbach, D

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INTERNATIONAL SEARCH REPORT

Information on patent family members

Inte :ional Application No
PCT/JP 99/00410

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		FR 2510020 A	28-01-1983
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